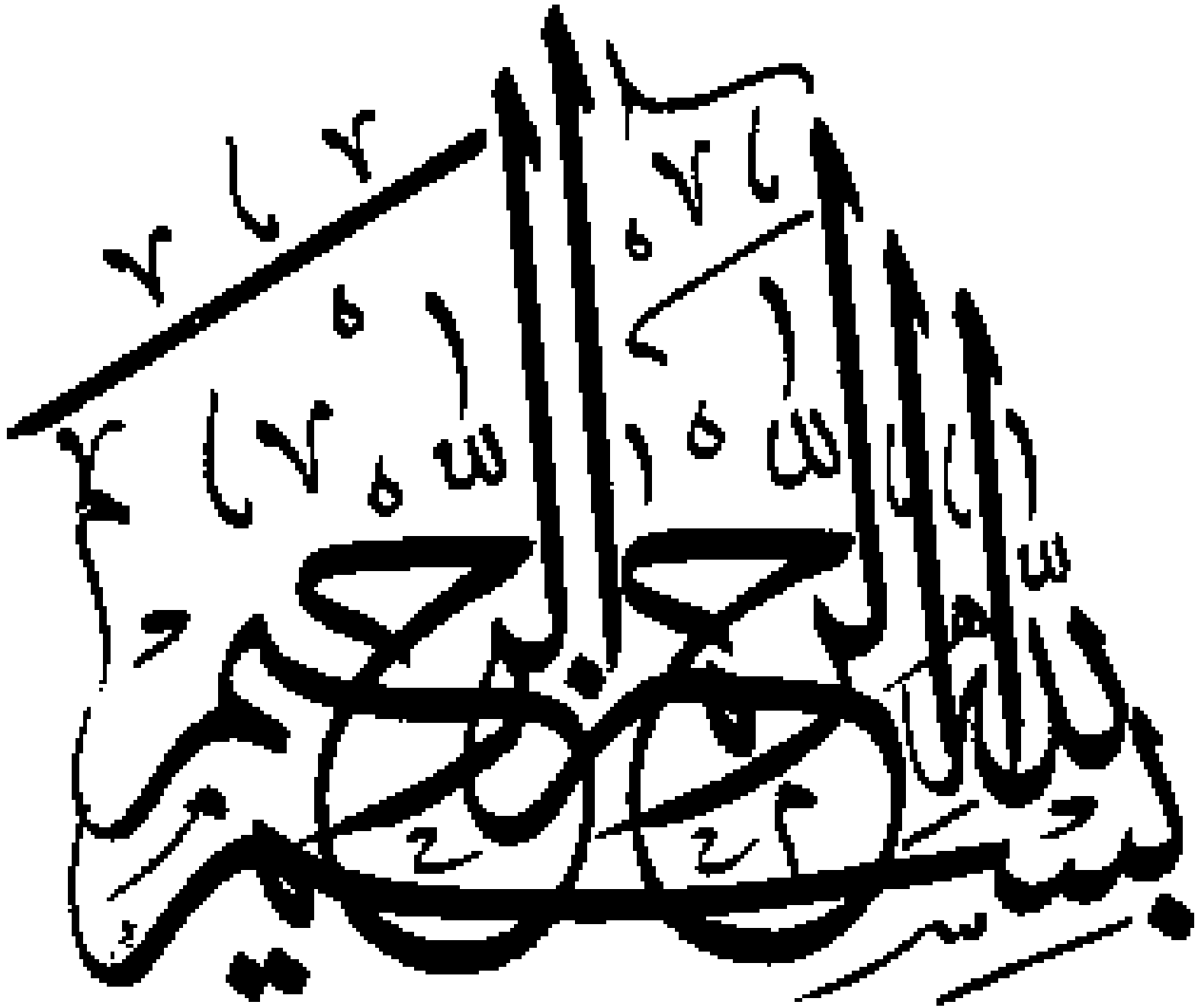


PERIPHERAL VASCULAR DISEASE

Dr.Hamid Reza Javadi
MD. cardiologist

PERIPHERAL VASCULAR DISEASE

- **1-Arterial disease:**

-arterial occlusive dis.
-fibromuscular dysplasia
-thromboangiitis obliterans
(burger dis.)
-Raynaud's
-Takayasu-giant cell arteritis.
-Acute arterial occlusion
-microembolism
-Levidoreticularis
-Thoracic outlet syndrome
-Arteriovenous fistula
-Acrocyanosis
-Wound of coldness-frost bite
-erythromelalgia

- **2-Venous disease:**

-Deep vein thrombosis
-superficial thrombophlebitis
-varicose veins
-Chronic venous insufficiency

- **3-lymphatic vessels:**

-lymphedema

PERIPHRAL ARTERIAL DISEASE

- **Peripheral arterial disease (PAD). definition:**

-Stenosis or occlusion in the aorta or arteries of the limbs.

- **Atherosclerosis is the leading cause of PAD in patients > 40 years old.**
- **Other causes include:**

thrombosis,

embolism,

vasculitis,

fibromuscular dysplasia,

entrapment,

cystic adventitial disease,

and trauma.

- **Highest prevalence of atherosclerotic PAD occurs in the 6” and 7” decades.**
- **there is an increased risk of PAD in:**
  - **cigarette smokers**
  - **persons with diabetes mellitus,**
  - **hypercholesterolemia,**
  - **hypertension,**
  - **hyperhomocysteinemia.**

Arterial occlusive disease
(arteriosclerosis obliterans , ASO)

- **Most common cause of lower extremity ischemic syndromes.**
- **Fewer than 50% of PAD are symptomatic:**

-many have a slow or impaired gait.

-Active patient :

intermittent claudication

-Inactive patient :

rest pain, ulceration, dependent rubor with edema, or gangrene

- **Symptoms is distal to level of stenosis:**
- **Aortoiliac disease :**

-impotence

- **Internal iliac stenosis:**

-hip and buttock claudication

- **Common femoral and external iliac dis. :**

-both thigh and calf claudication

- **Superficial femoral dis. :**

-entire calf claudication

- **Popliteal or infrapopliteal disease:**

-foot and calf claudication

- **Important *physical findings* of PAD:**

-decreased or absent pulses distal to obstruction.

-Bruits over the narrowed artery.

-muscle atrophy.

-With severe disease: hair loss, thickened nails, smooth and shiny skin, reduced skin temperature, and pallor or cyanosis.

-with critical limb ischemia: ulcers or gangrene.

-Legs elevation and repeated flexing of the calf muscles produce pallor of the soles of the feet,

-when the legs are dependent, rubor, secondary to reactive hyperemia, may develop.

PATHOLOGY

-Atherosclerotic plaques with calcium deposition,

-thinning of the media,

-patchy destruction of muscle and elastic fibers,

-fragmentation of the internal elastic lamina,

-and thrombi composed of platelets and fibrin.

- **Primary sites of involvement:**
- **femoral and popliteal arteries (80–90% of patients),**
- **the more distal vessels, including the tibial and peroneal arteries (40–50% of patients).**
- **abdominal aorta and iliac arteries (30% of symptomatic patients),**

prevalence

- ASO is relatively high prevalence
- Increases with age
- Annual incidence in men , 0.3%
- In women 0.1%
- Prevalence of int.claud. 1.8% for age<60
- 3.7-5% for age >60
- Risk factor of ASO reflect those for CAD
- Risk of death increases as the ABI decrease
- Normal ABI ≥ 1, ABI<0.5 = sever ischemia
- 5-year mortality of an ABI<0.85 is 10%
  an ABI<0.40 is 50%
- Amputation rate is around 1% per year

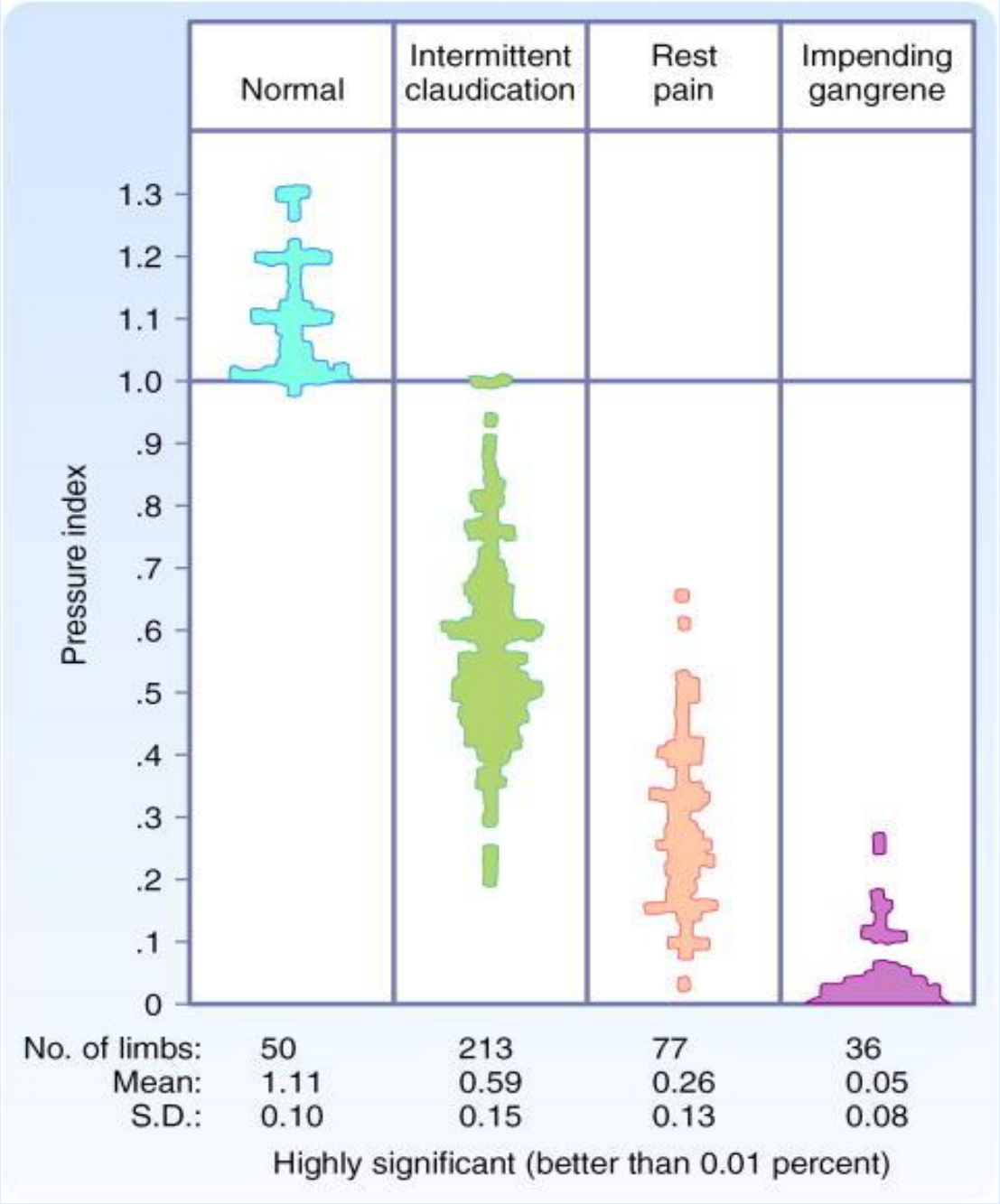
- **history and physical exam. are often sufficient to diagnosis of PAD.**

- **Arterial pressure can be recorded noninvasively in the legs by placement of sphygmomanometric cuffs at the ankles and use of a Doppler device to auscultate or record blood flow from the dorsalis pedis and posterior tibial arteries.(ABI)**

Ankle-Brachial Index

- **Comparison of ankle pressure to brachial SBP**
- **Reproducible, useful for long term surveillance**
- **Normal 0.85-1.2**
- **Claudicants 0.5-0.7**
- **Critical ischemia < 0.4**
- **May be falsely elevated in calcified vessels (DM).**

ABI


Normal
Intermittent claudication
Rest pain
Impending gangrene
Pressure index
1.3
1.2
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
No. of limbs: 50 213 77 36
Mean: 1.11 0.59 0.26 0.05
S.D.: 0.10 0.15 0.13 0.08
Highly significant (better than 0.01 percent)

- **Other noninvasive tests include:**

-segmental pressure measurements,

-pulse volume recordings,

-Doppler flow velocity waveform analysis,

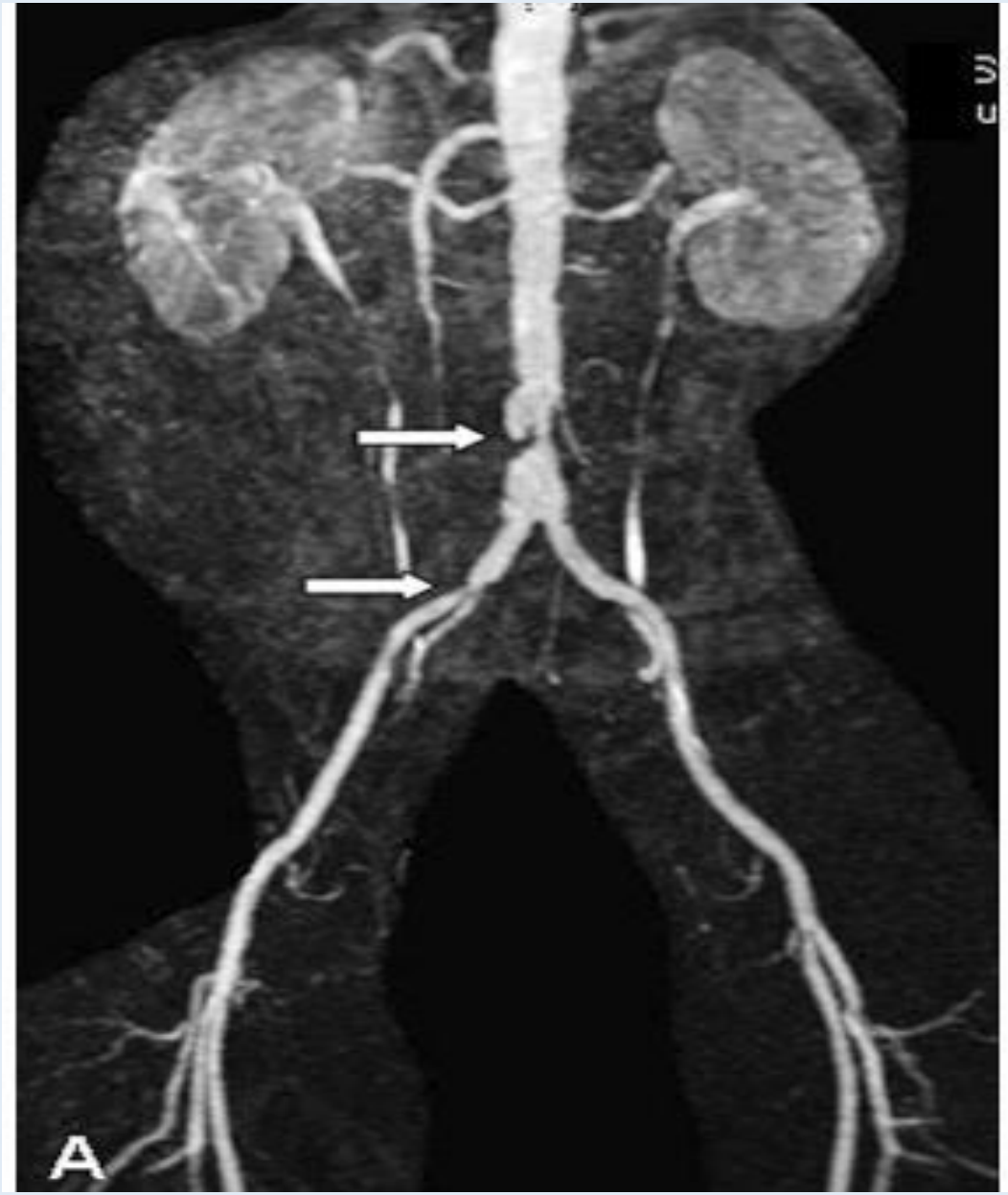
-duplex ultrasonography

(B-mode imaging and pulse-wave Doppler exam.),

-transcutaneous oximetry,

-stress testing (usually treadmill),to assess functional limitations.

MRA.
patient with intermittent claudication, showing stenoses of the distal abdominal aorta and right common iliac artery (*A*)



stenoses of the right and left superficial femoral arteries (*B*).

PROGNOSIS

- **Influenced by the extent of coexisting CAD and cerebrovascular disease.**

- **Patients with PAD have a 15–30% 5-year mortality rate ,and a two- to sixfold increased risk of death from CAD.**

Treatment

- **Aggressive Risk factor modification.**
- **Smoking cessation/Control of diabetes.**
- **Lipid lowering/Hypertension control.**
- **Walking program(20-30 min 4-5 days per week).**
- **Diligent foot acre.**
- **Pentoxyfilline, cilostazol for claud., verapamil.**
- **Surgical revascularization.**
- **Percutaneous balloon angioplasty, with or without stent for proximal renal or iliac arteries.**

DRUG

- **BP control in hypertensive patients.**
- **ACEi may reduce the risk of cardiovascular events in symptomatic PAD.**
- **β-blockers do not worsen claudication and used to treat HTN, especially in coexistent CAD.**
- **Statins in hypercholesterolemi is reduce the risk of MI, stroke and death.**

  (LDL cholesterol to <100 mg/Dl).
- **Platelet inhibitors, particularly aspirin, reduce the risk of adverse cardiovascular events in peripheral atherosclerosis.**

- **Pentoxifylline, a substituted xanthine derivative, decrease blood viscosity and increase red cell flexibility, thereby increasing blood flow to the microcirculation and tissue oxygenation.**

- **Cilostazol, a phosphodiesterase inhibitor with vasodilator and antiplatelet properties, increases claudication distance by 40–60% and improves measures of quality of life.**

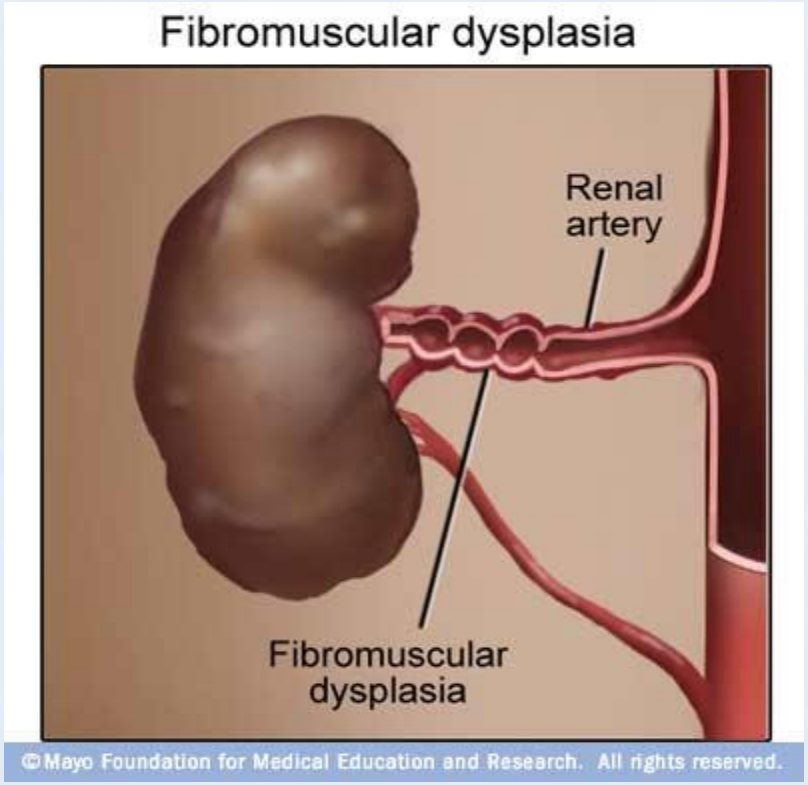
- Anticoagulant warfarin is not indicated.
- Medical treatment of PAD has not been as successful as CAD.
- Adrenergic blocking agents, calcium channel antagonists, papaverine, and other vasodilators have not been effective in patients with PAD.

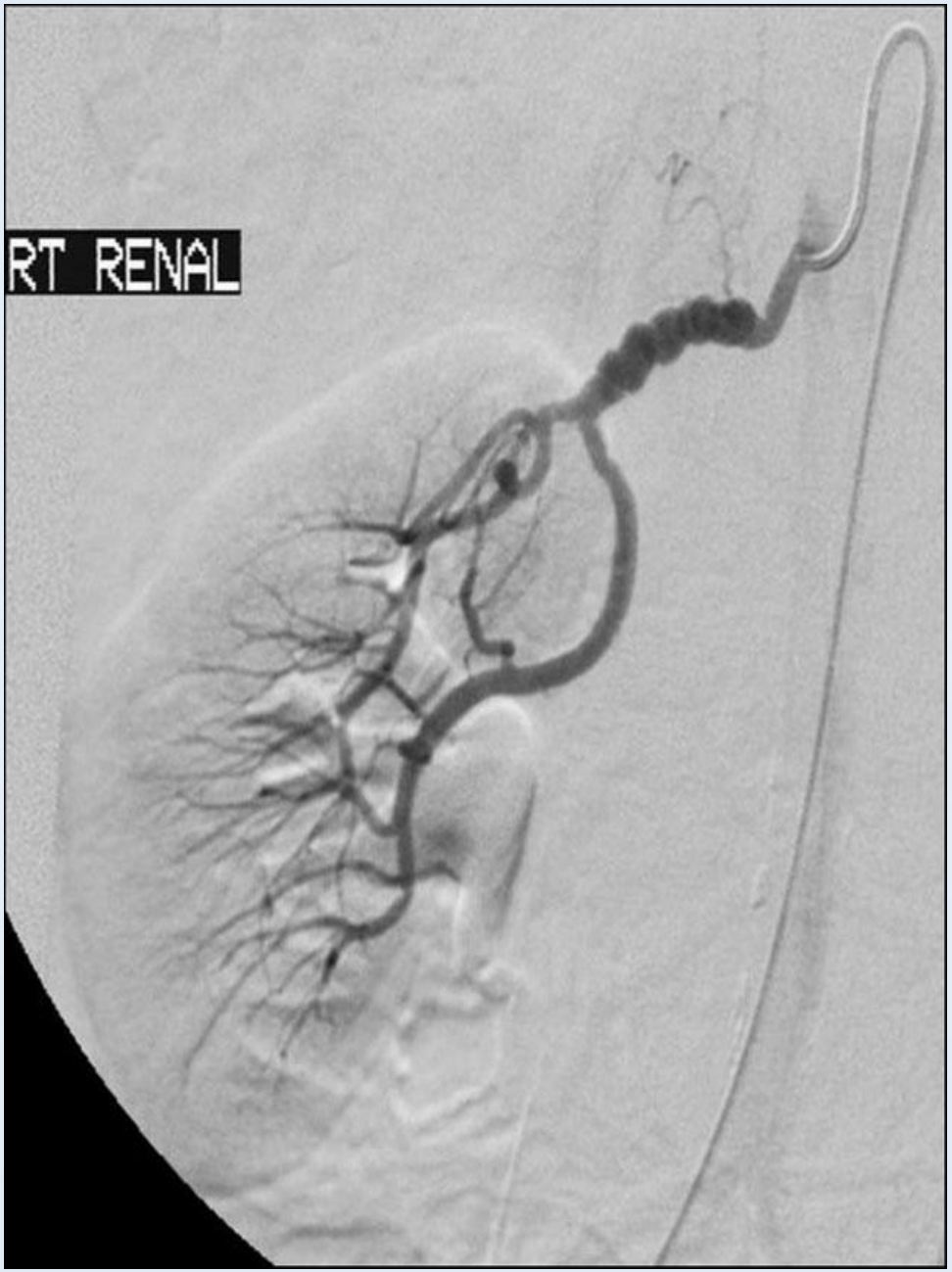
Fibromuscular dysplasia

- **Hyperplastic disorder in medium & small artery.**
- **Female>male.**
- **Common site ,in renal and carotid artery.**
- **Dysplasia can be seen in intima, media, advantis.**
- **Commonest form is medial dysplasia.**
- **Treatment: PTA & surgery.**

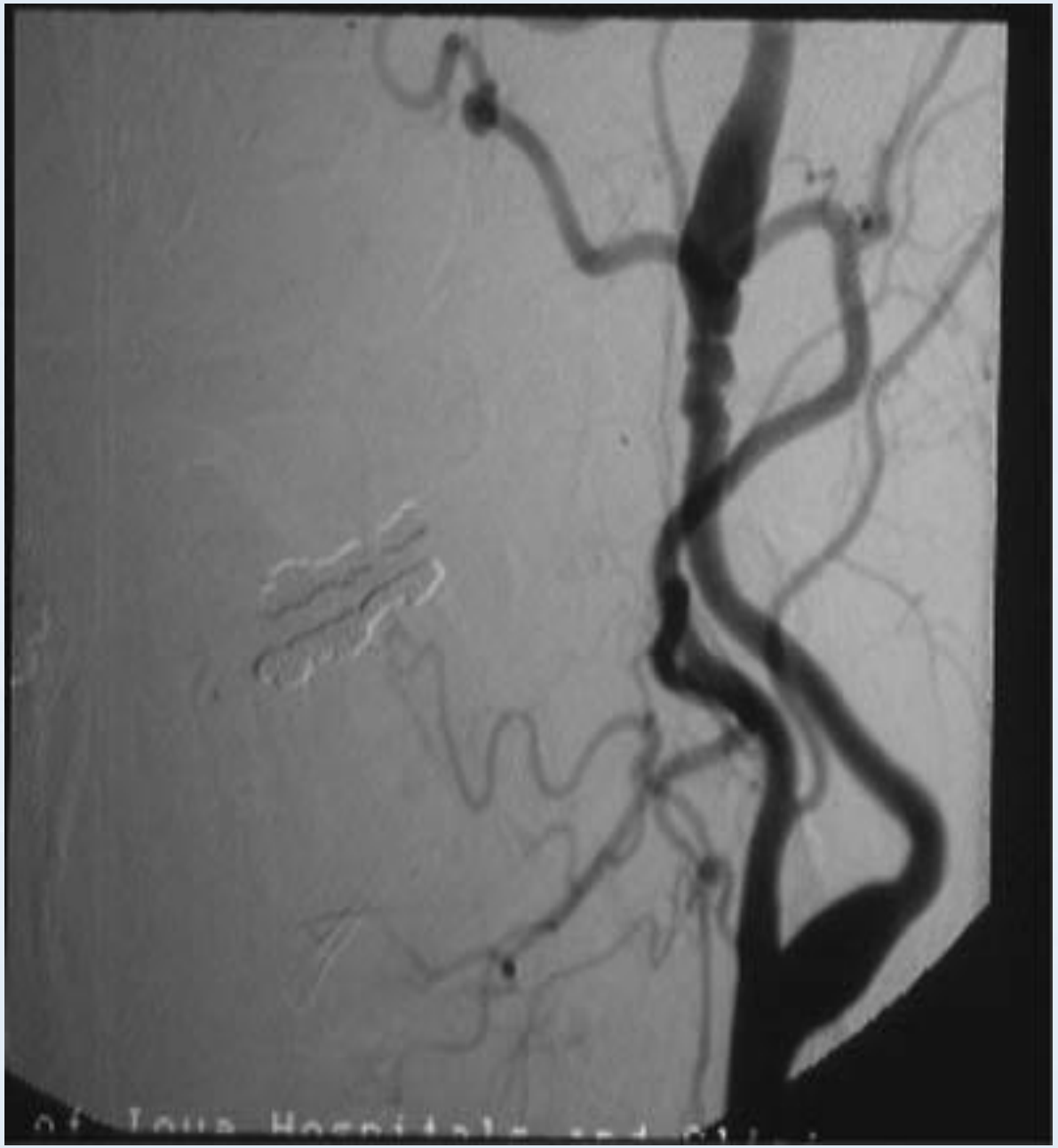
- **histologic classification:**
  - **Intimal fibroplasia,**
  - **Medial dysplasia,**
  - **Adventitial hyperplasia.**
- **Medial fibroplasia is the most common type ;**
- **characterized by alternating areas of thinned media and fibromuscular ridges.**
- **iliac arteries are the limb arteries most likely to be affected by fibromuscular dysplasia.**

Fib.mus.dys.of renal artery





Fibromusculer dyslpasia of carotid



Thromboangiitis obliterans (TAO) , Bureger's disease

- **Inflammatory vasculopathy , with highly cellular intraluminal thrombus, affects small and medium-size arteries and veins in the distal upper and lower extremities.**

- **Cerebral, visceral, and coronary vessels may be affected rarely.**

- **Triad**:

-Claudication,

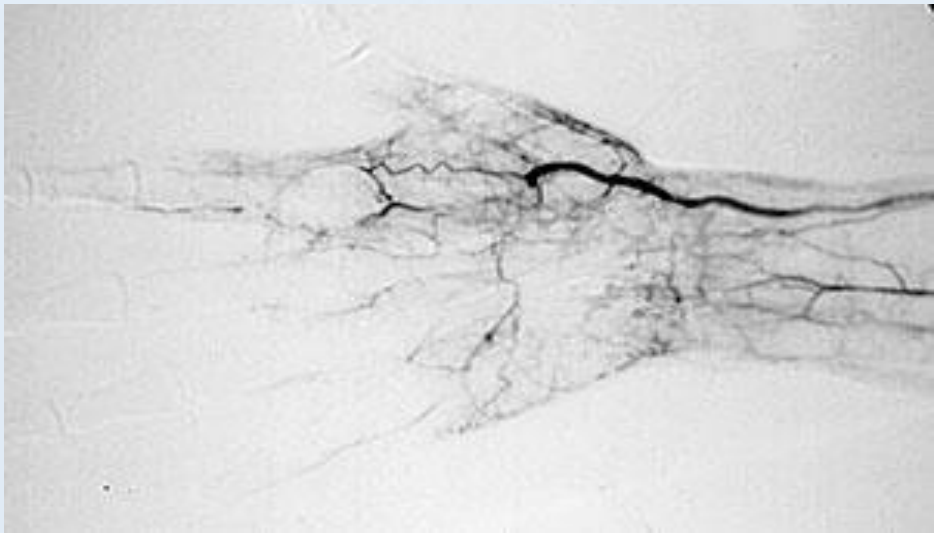
-Raynaud,

-Migratory superficial vein thrombophlebitis .

- Always associated with tobacco use.

- Predominantly in males in 2” to 5” decads.
- Initial involvement is digital, pedal, and hand vessels, then , calf, thigh, and forearm.
- 1/3 of patients reports Raynaud’s phenomenon.
- Angiographic figures are characteristic.
- Improvement is possible only after tobacco ceases.
- Surgical sympathectomy,arterial bypass,debridement ,IV prostacyclin, amputtion.

- **Recurrent superficial thrombophlebitis ("phlebitis migrans")**
- **Young adults, heavy smokers, no other atherosclerotic risk factors**
- **Angiography - diffuse occlusion of distal extremity vessels**
- **Progression - distal to proximal**

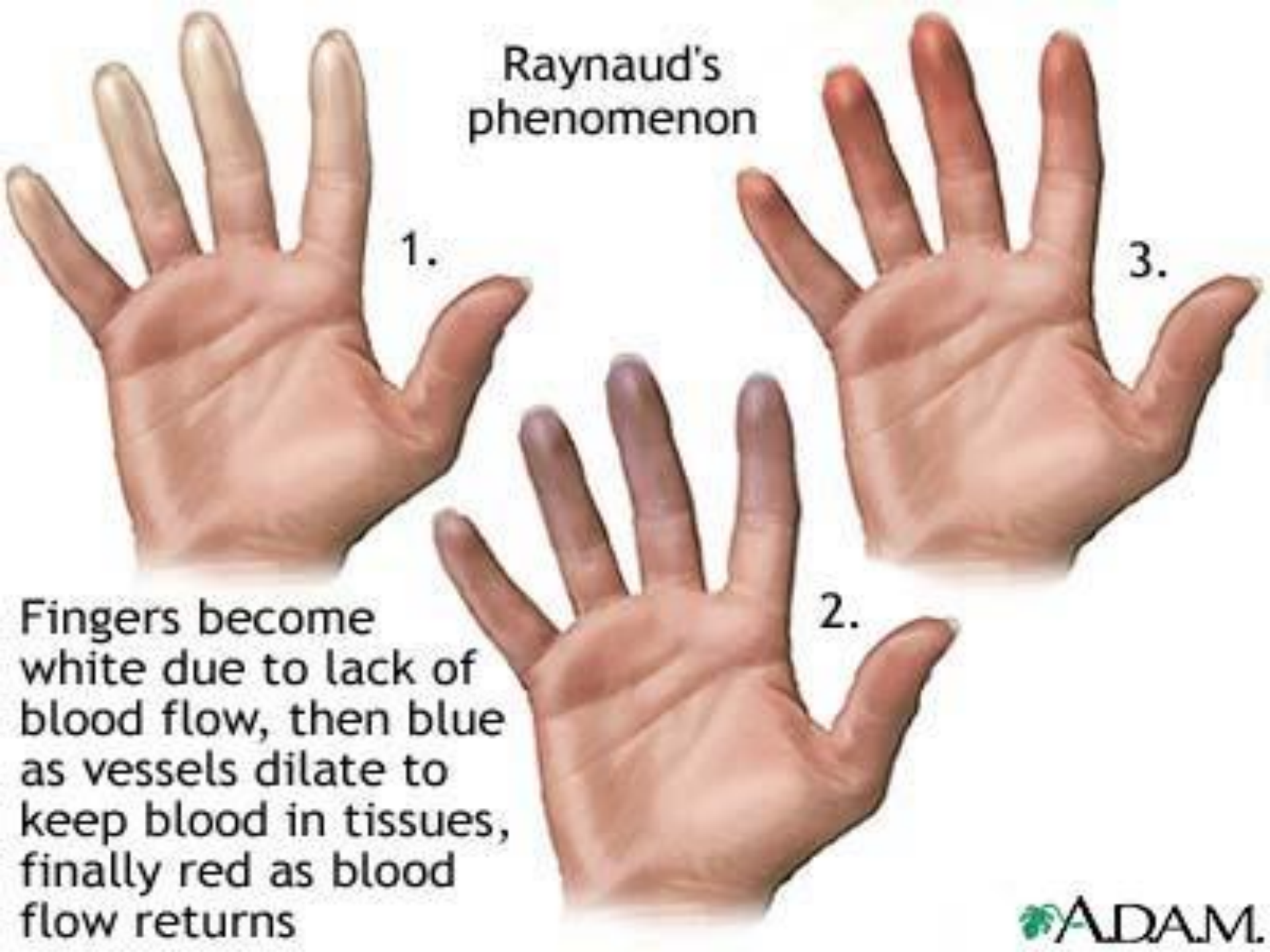


TAO


Diminished blood supply causes damage and death of tissue
Obstructed blood vessel
Dead tissue beyond obstruction
A.D.A.M.

Raynaud's phenomenon (periodic ischemia of digits)

- **Definition: episodes of blue or white color changes of digits (fingers> toes) , followed by reactive hyperemia during recovery ,induced by cold or emotion, with dead numb feeling in ischemic phase ,and dysesthetic or painful sensation during recovery,**
- **diagnosed with history alone.**
- **Recovery time is 3 to 10 min, (1 h in advanced cases).**


Raynaud's phenomenon
1.
2.
3.
Fingers become white due to lack of blood flow, then blue as vessels dilate to keep blood in tissues, finally red as blood flow returns
A.D.A.M.

- **Primary, idiopathic, or Raynaud's disease (50% of Raynaud phenomenon):**

- episodes of bilateral color changes induced by cold or emotion
- without ischemia or other disease , -
- for 2 years ,
- most patient require no therapy,
- F/M = 5 ,age 20-40 ,
- 10% with sclerodactylia.

- **Secondary:**

- (50%) , with secondary causes ,that treated with underlying cause.

- **Ca blockers and non-beta-adrenergic blocking sympatholytics can suppress the episodes, with little impact on ischemic complication.**
- **Ischemic complication are best treated with local debridement ,and pain-infection controle.**

Secondary causes of Raynaud's dis.

Hematologic disorders Environmrntal cold injury Atherisclerosis in men>50	Hypothenar hammer synd. Vinyl chloride dis. TAO.SLE.RA.sclerodermia
Neurogenic thoracic outlet synd. carpal tunnel synd. Spinal cord tumor neuropathy.poliomyelitis	Medication beta blockers, ergotamin methysergide, estrogen Vinblastin, Bleomycin imipramin
Myxedema , Acromegaly	Pulmonary hypertension Vibration syndrome.trauma

TREATMENT

- **WARM CLOUTH**
- **CIGARETT CESSATION**
- **ALPHA BLOKERS:RESERPIN.PRAZOSIN.**

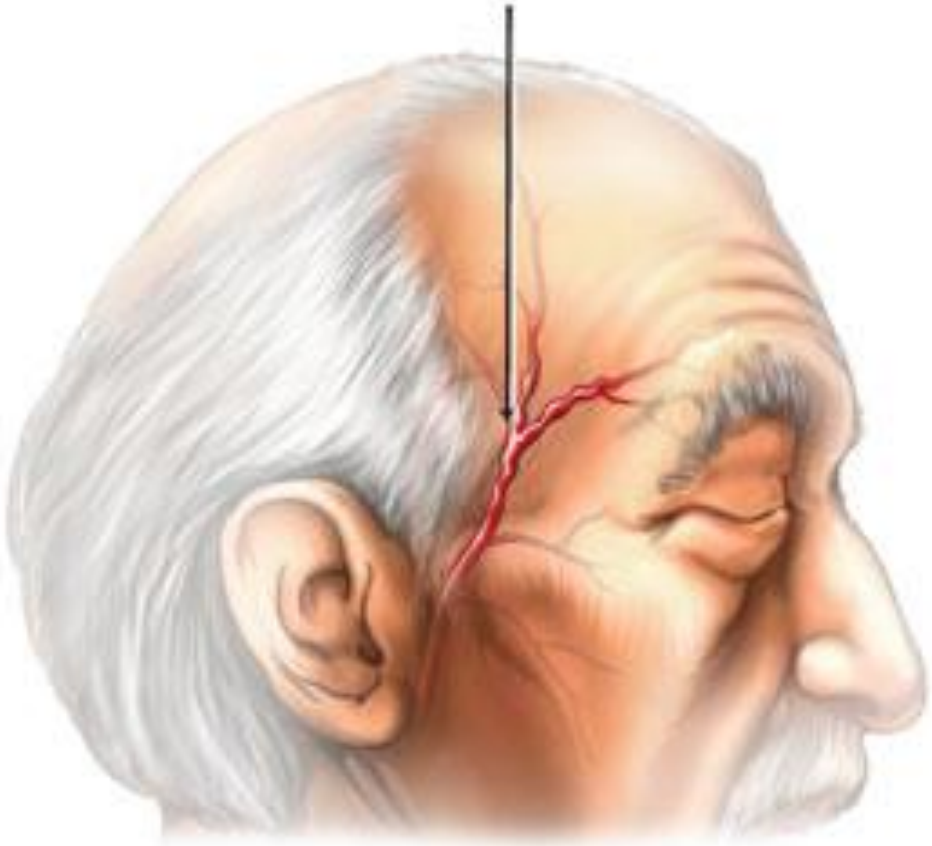
TRAZOSIN.DOXAZOSIN

- **SYMPATHOLITICS:METHYLDOPA…**
- **SURGICAL SYMPATHECTOMY.**

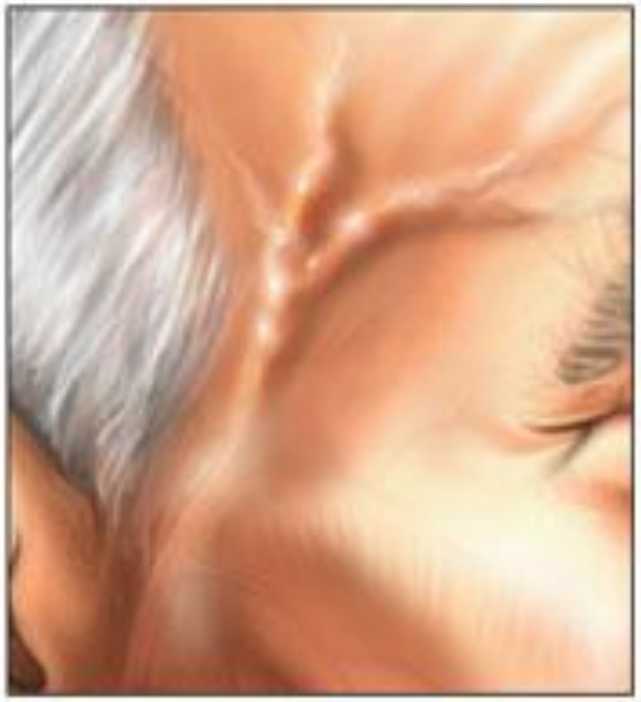
TAKAYASU'S AND GIANT CELL ARTERITIS

- are similar in pathologic process
- but affect different age groups
- Takayasu's arteritis involves below the neck
- GCA or Temporal arteritis involves above the neck
- Is usually bilateral, results in claudication
- Progresses briskly , ischemia is rare
- Elevated ESR. , typical arteriographic fig.
- Acute stenosis improves with steroid
- Adjunctive cytotoxic drugs are also useful

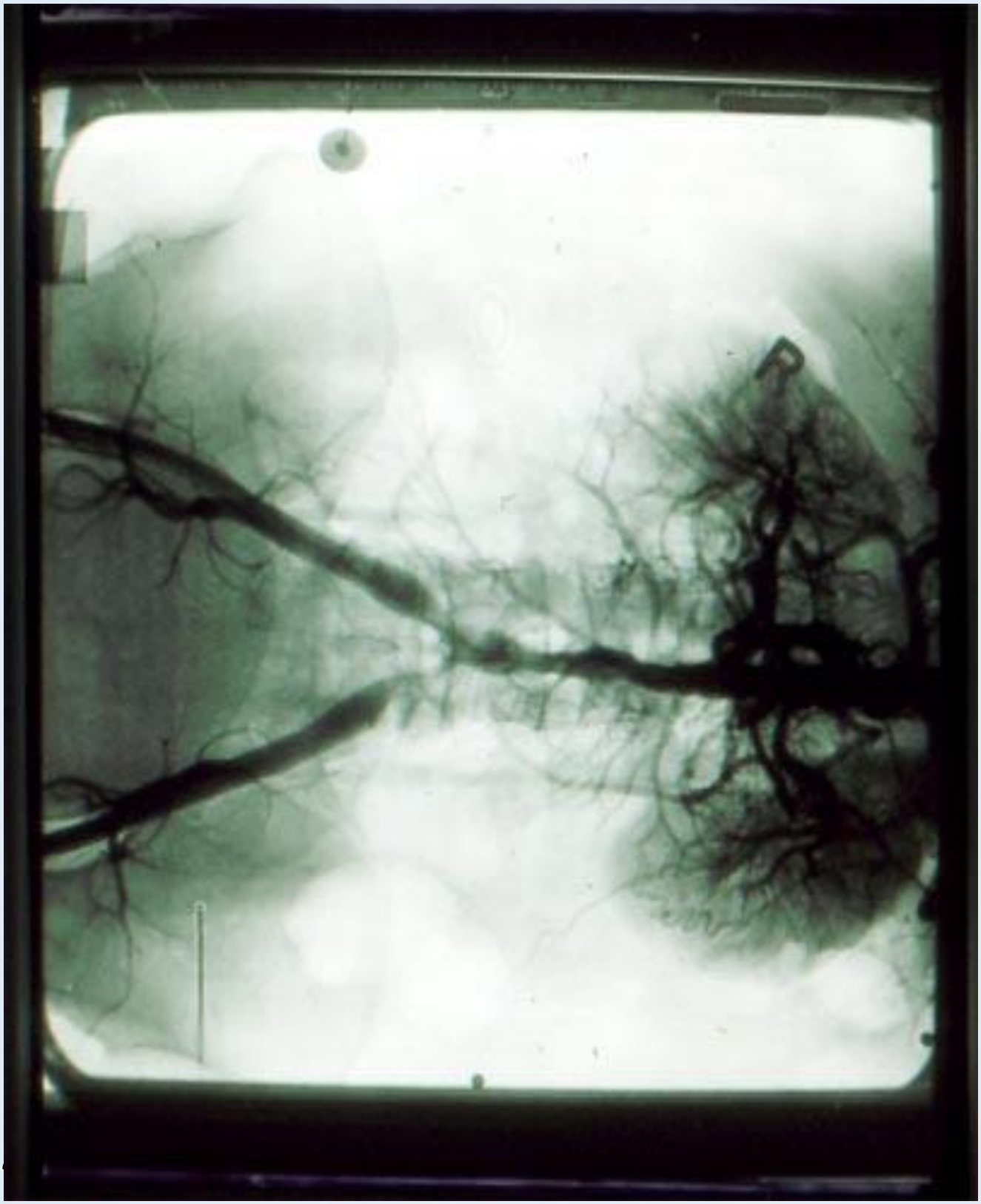
Superficial temporal artery



Giant cell arteritis



Takayasu



Acute arterial occlusion

- Clinical pentad of:
- pain ,
- pallor,
- paresthesia
- Paralysis
- pulselessness.

Etiology

- **Trauma and dissection**

(penetration, crush or fracture, deceleration injuries)

- **Thrombosis in situ**

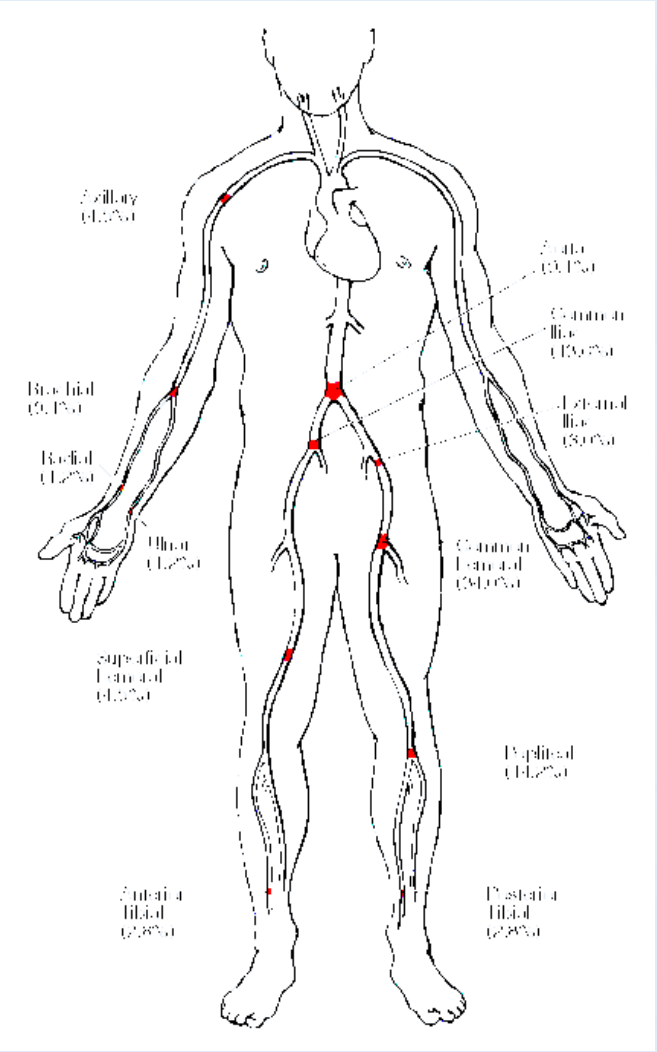
(occurs with both occlusive and aneurysmal disease)

- **embolism**

(majority come from the heart, small percentage from proximal occlusive or aneurysmal arterial lesion, tend to be multiple, recurrent, and to disturb randomly)

Sites of Embolization

- **Bifurcations**
  - **Femoral - 40%**
  - **Aortic - 10-15%**
  - **Iliac - 15%**
- **Popliteal - 10%**
- **Upper extremities - 10%**
- **Cerebral - 10-15%**
- **Mesenteric/visceral - 5%**



MANAGMENT

- **PROTECT THE LIMB , AND RESTORE BLOOD FLOW**
- **HEPARIN TO PREVENT CLOT PROPAGATION**
- **ANGIOGRAPHY**
- **EMBOLECTOMY**
- **URGENT REPAIR IN SEVERE ISCHEMIA**
- **LYSIS OF ACUTE OCCLUSION , IF INDICATED**
- **Acute arterial occlusion, is often preventable**

Microembolism (Atheroembolism)

- **Usually originates from ulcerative plaque(atheroemboli) or aneurysm and rarely from the heart**
- **Blue toe syndrome , and levido reticularis in skin**
- **Solitary lesion showering atheroemboli: surgery**
- **Suprarenal sources: azotemia**
- **Aortic Thromboulcerative dis.: shower emboli randomly to brain, viscera, kidney, skin and muscle**
- **anemia, leukocytosis, azotemia, elevated ESR, abnormal U/A , usually are noted**
- **Microembolism May be spontaneous, or percipitated by surgery, instrumentation, or anticoagulation therapy**
- **Platelet inhibitors for prevention, and surgery for treat.**

LIVEDO RETICULARIS

- **Definition: persistent, symmetric, bluish lacy pattern on the extremities and sometimes the trunk, variable in intensity and extent, most apparent by cold or emotion, and fades by warmth and exercise, first seen in childhood or puberty and more common in women and fair-skinned individuals**

- **Spasm of cutaneous arterioles with secondary dilatation of capillaries and venules , causes slow flow ,increased oxygen uptake reduced oxyhemoglobin , and color change**

Livedo reticularis

- **Primary: seen with acrocyanosis and raynaud's phenomenon, treatment is rarely needed**
- **Secondary: is patchy, focal, asymmetric, late in onset, may by complicated by infarction and ulceration**

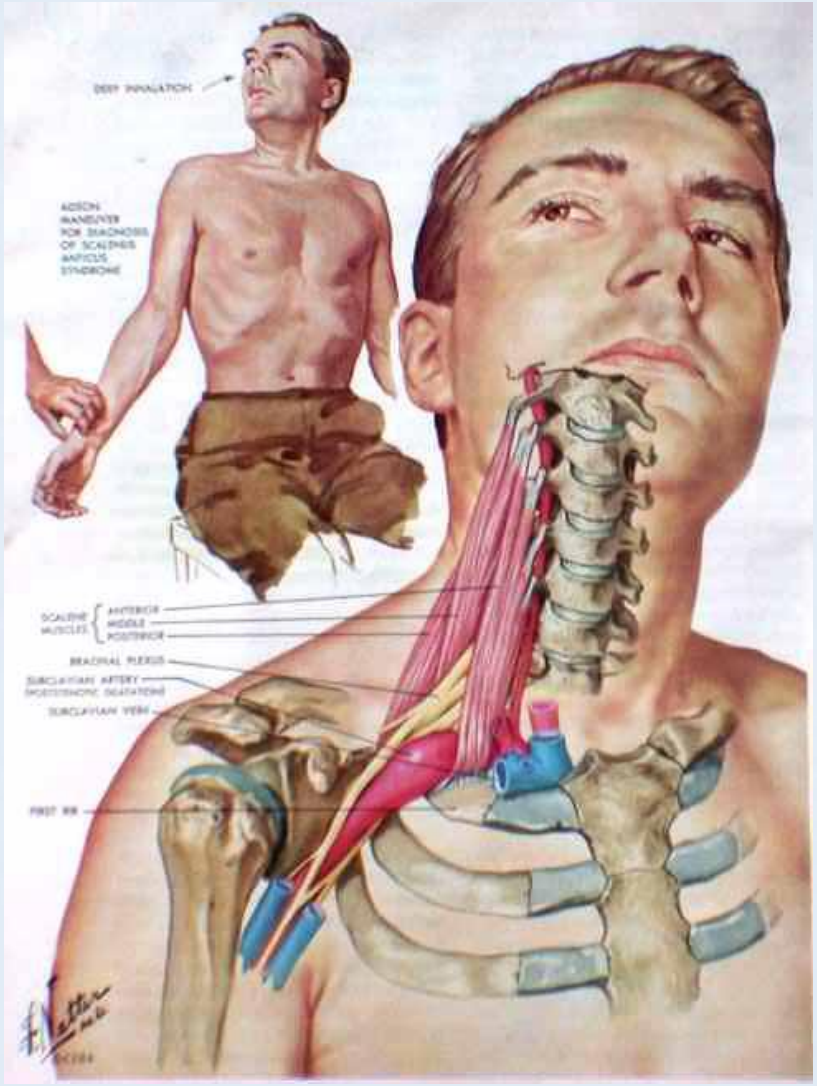
Treatment is directed to underlying cause,

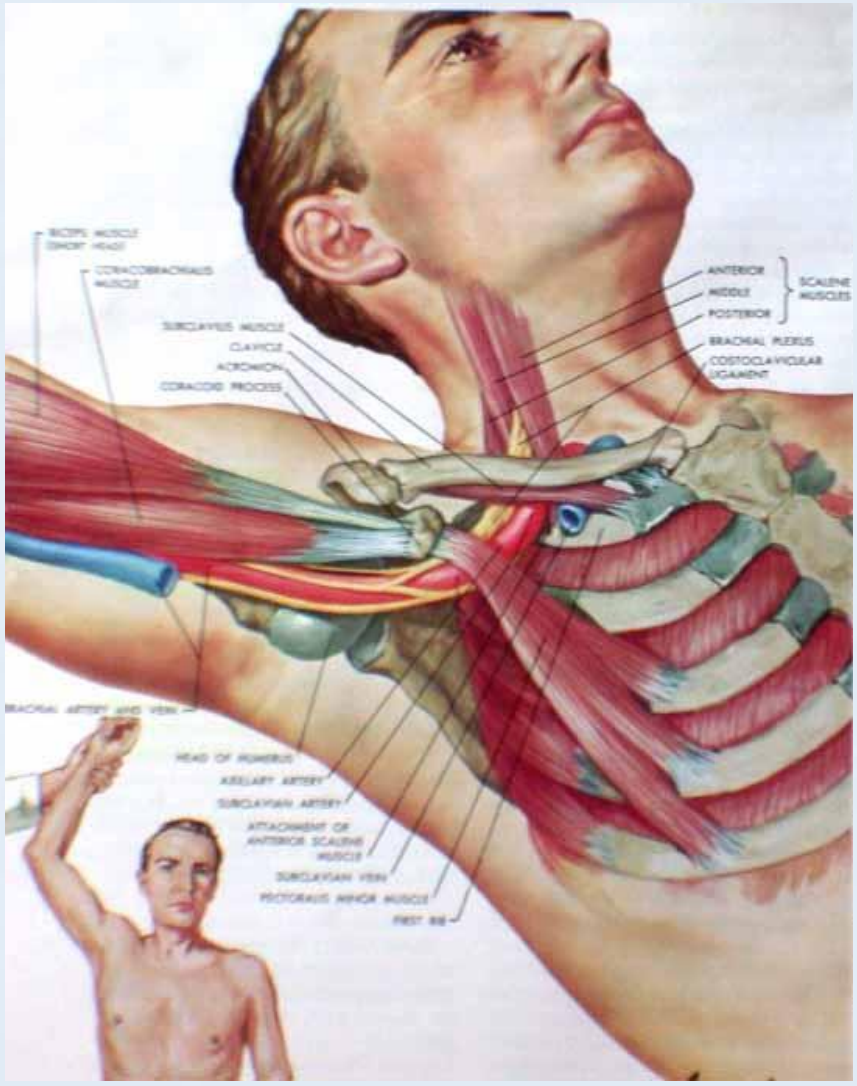
Avoidance of coldness

etiologies	
Environmental (cold)	Reflex sympathetic dystrophy
Atheroembolism (cholesterol)	Myeoproliferative dis
Connective tissue dis	Vasculitis
Cutaneous vasculitis	thrombocytosis
Amantadine HCL	

Thoracic outlet syndrome

- **An osseous lesion(commonly a cervical rib) ,or muscular abnormality causes an aneurysm or stenosis of subclavian artery, predisposes to thrombosis and Raynaud's phenomenon (a scissors of cervical or first rib with clavicle) ,or compress the brachial plexus**
- **Venous-neurogenic complaint may present**
- **Young active patient , complaint of arm fatigue , swelling, or paresthesia**
- **Diagnosis: ultrasound, arteriography, and clinical correlation**
- **Correction: Resection of cervical rib or first rib or resection of the scalenus anticus muscle.**

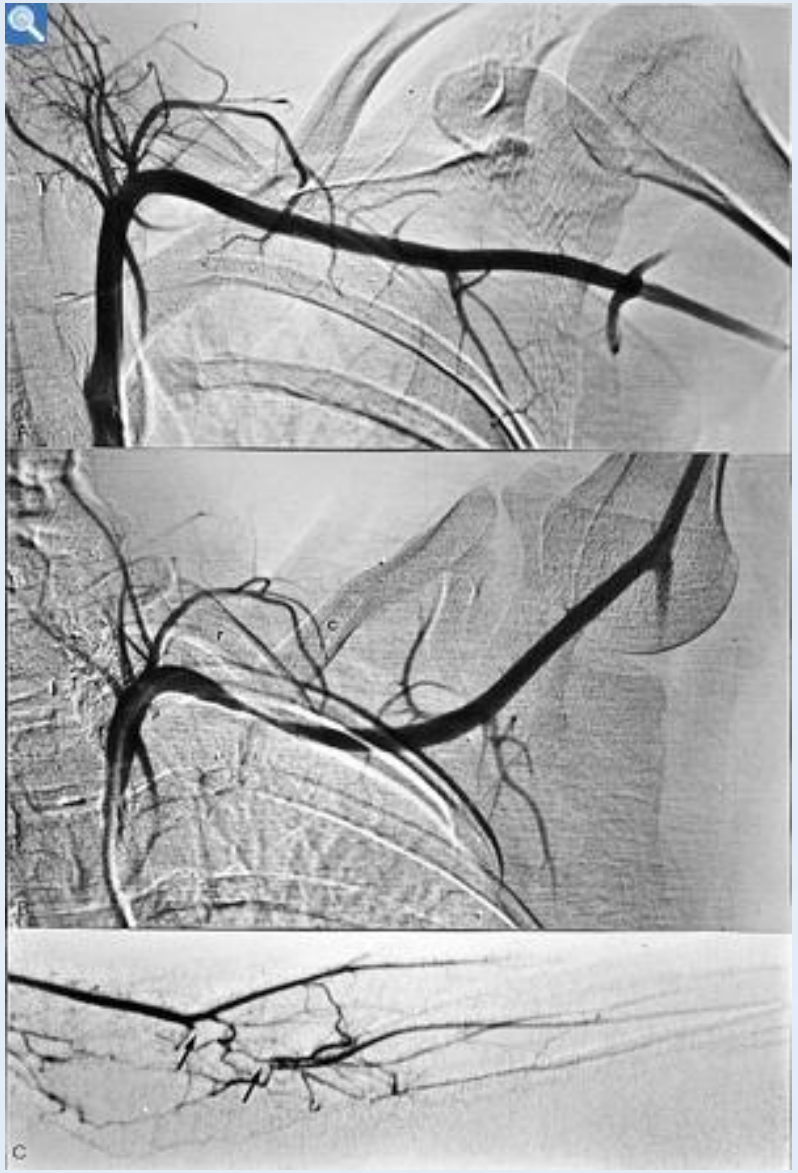

DEEP INHALATION
ADSON MANEUVER FOR DIAGNOSIS OF SCALENUS ANTICUS SYNDROME
SCALENE MUSCLES
ANTERIOR
MIDDLE
POSTERIOR
BRACHIAL PLEXUS
SUBCLAVIAN ARTERY
SUBCLAVIAN VEIN
FIRST RIB


BICEPS MUSCLE (SHORT HEAD)
CORACOBRACHIALIS MUSCLE
SUBCLAVIUS MUSCLE
CLAVICLE
ACROMION
CORACOID PROCESS
ANTERIOR
MIDDLE
POSTERIOR
SCALENE MUSCLES
BRACHIAL PLEXUS
COSTOCLAVICULAR LIGAMENT
BRACHIAL ARTERY AND VEIN
HEAD OF HUMERUS
AXILLARY ARTERY
SUBCLAVIAN ARTERY
ATTACHMENT OF ANTERIOR SCALENUS MUSCLE
SUBCLAVIAN VEIN
PECTORALIS MINOR MUSCLE
FIRST RIB

Thoracic Outlet Syndrome

- **Upper extremity symptoms due to compression of the neurovascular bundle in the thoracic outlet area**
- **3 Types**
  - **Neurogenic - most common (95%)**
  - **Venous 2-3%**
  - **Arterial 1%**
- **Exacerbated by elevation, abduction, hyperextension of arm**

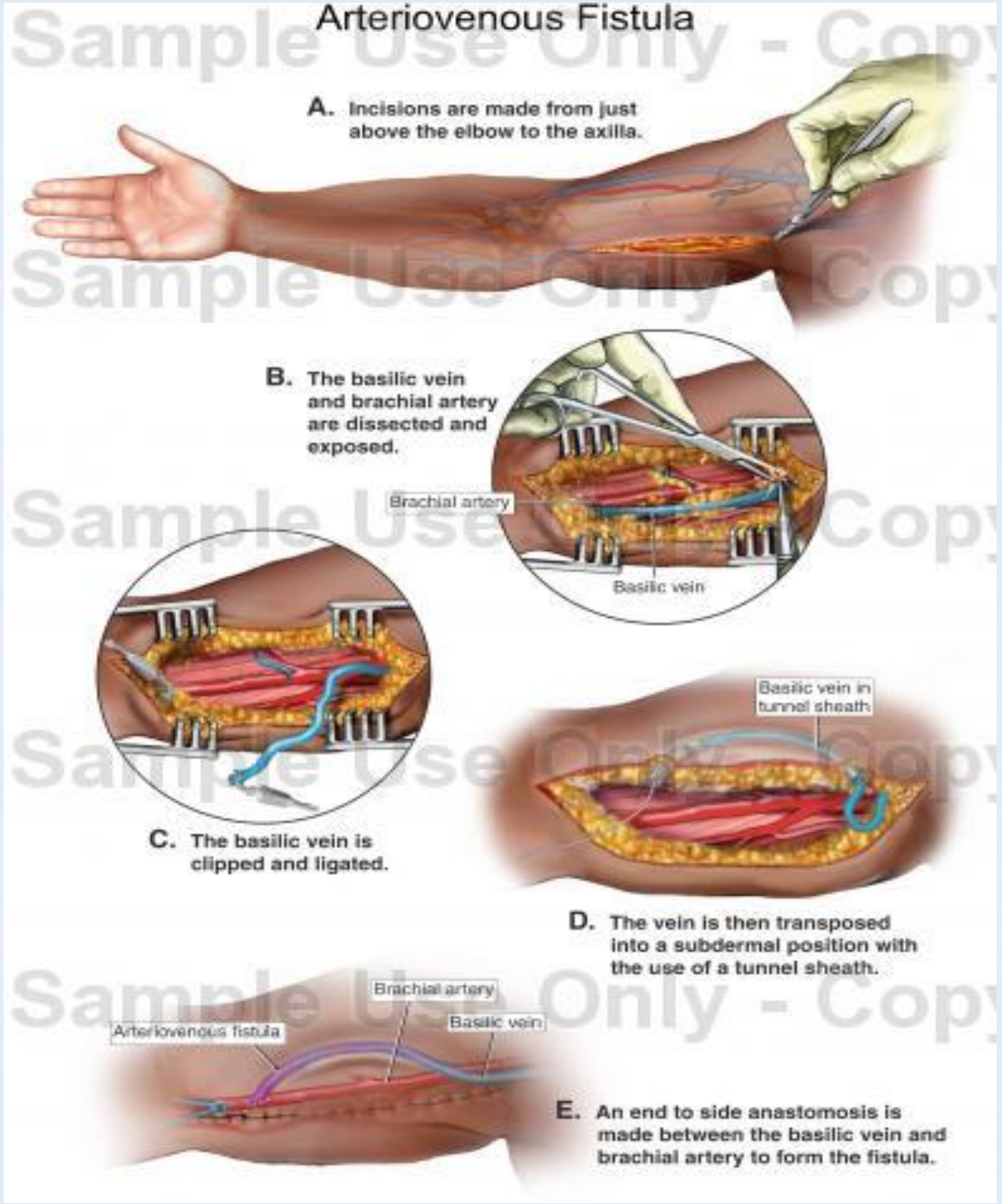
Thorasic outlet syndrome



Arteriovenous fistula

- **Abnormal communication between artery and venous**
- **Congenital , aqcuired (by physician, for vascular access in hemodialysis , or trauma such as stab wound and …)**
- **Pulsetile tumor, with bruie, and trill , occasionally high CO –CHF**
- **Treatment:**

supportive such as elastic stocking , interventive such as Embolisation, stenting, surgery,….


Arteriovenous Fistula
A. Incisions are made from just above the elbow to the axilla.
B. The basilic vein and brachial artery are dissected and exposed.
Brachial artery
Basilic vein
C. The basilic vein is clipped and ligated.
Basilic vein in tunnel sheath
D. The vein is then transposed into a subdermal position with the use of a tunnel sheath.
Brachial artery
Basilic vein
Arteriovenous fistula
E. An end to side anastomosis is made between the basilic vein and brachial artery to form the fistula.

Arteriovenous fistula in sinus cavernous

Acrocyanosis

(arterial constriction & capillary and venouls dilatation)

- **Definition:**

benign, persistent cyanotic discoloration and coolness of hands or fingers or sometimes feet,

-seen more commonly in women ,

-intensify with cold and emotion,

-ameliorate with warmth and exercise ,

-sometimes mild local edema,

-painless,

-dose not ulcerated,

-but a cosmetic problem,

-Associated hyperhidrosis may require treatment.

- **Ca blockers or alpha antagonists often reduced symptom**

Acrocyanosis

Pernio
(wound of coldness- Chilblains)

- **A vasculitis disorder in conjunction with coldness**
- **In lower portion of calf and foot**
- **Treatment : warmth, and wound management**
- **sympatholytic drugs**

PERNIO

PERNIO

Frostbite

- **Tissue damage in very cold environment**
- **Cyanosis, erythema, urticaria, edema, and superficial bolouse with warmth**
- **Hand and foot edema and gangrene**
- **Treatment: 40-44 centigrade warm bath and dressing with analgesic and antibiotic if indicated ,**

frostbite

Erythromelalgia

- **Pain and erythem of upper and lower extremity in conjunction with heat, relief with coldness ,water and upstanding**
- **Foots>Hands**
- **Male> Female**
- **Primary ,**
- **secondary to myeloproliferative disease**
- **aspirin in secondary to myeloproliferative dis. May be usefull .**

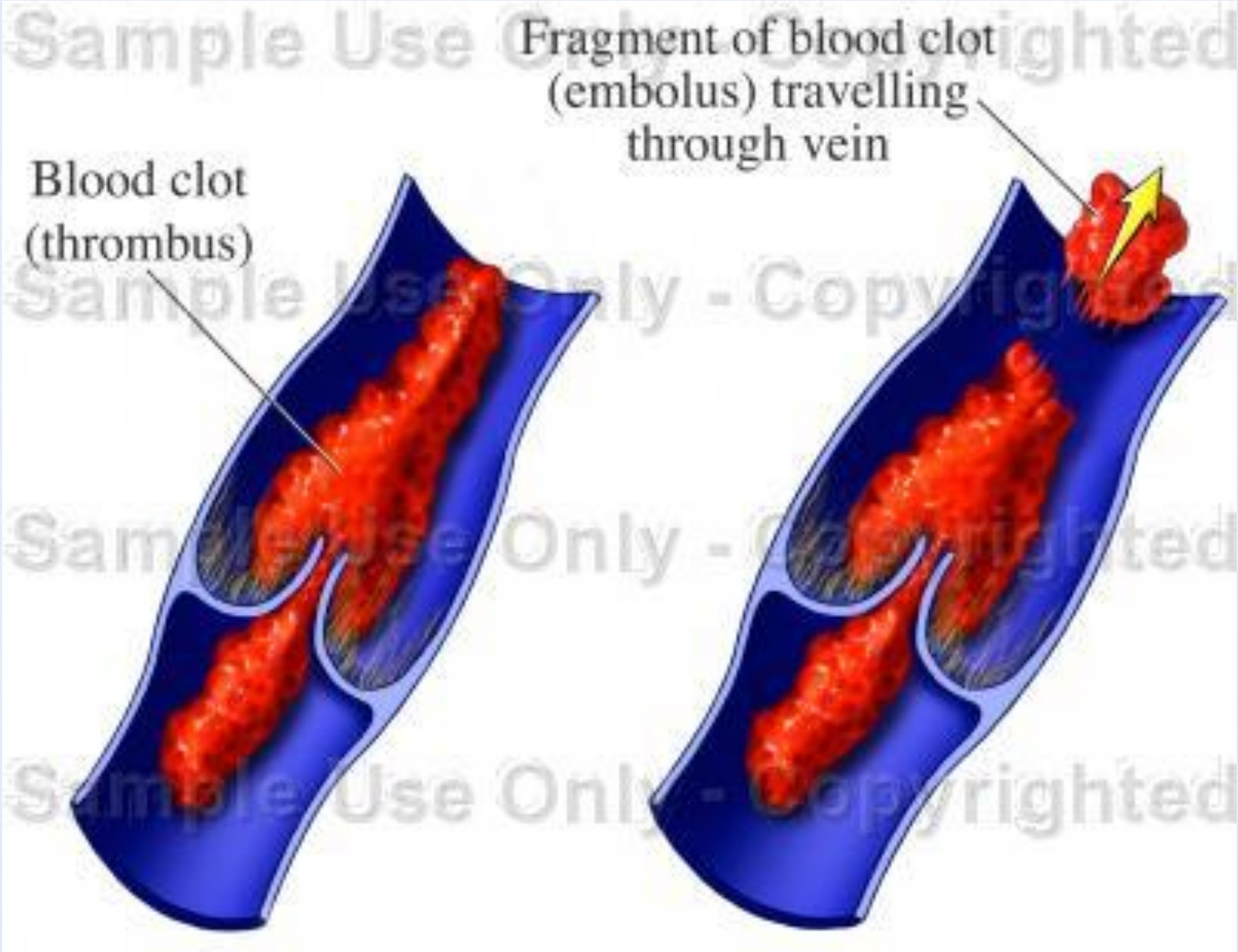
Erythromelalgia

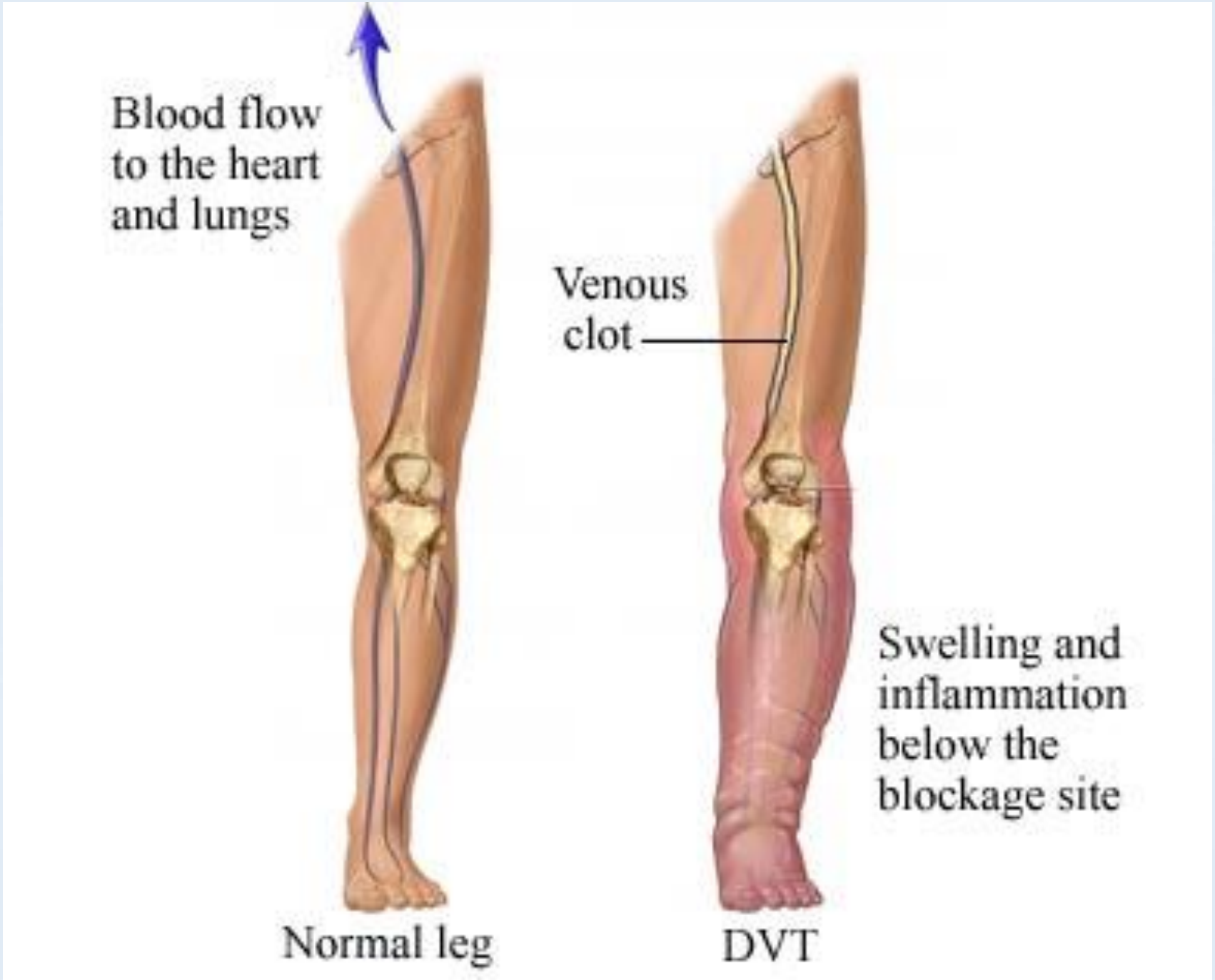

IRAN PAYA

Venous disease

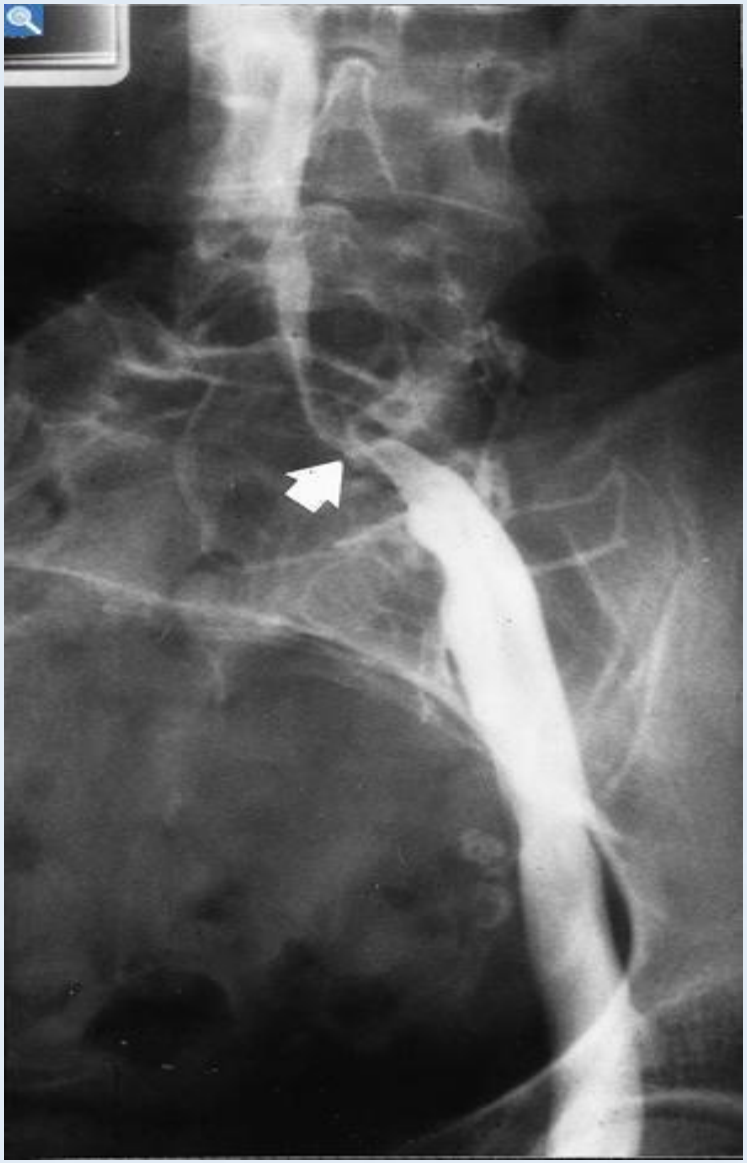
Deep Vein Thrombosis

- Risk factors:
- **Immobility**
- **Recent surgery**
- **Progesterone therapy**
- **Residency in care facility**
- **Prior DVT**
- **Hospitalization**
- **Malignancy**
- **Trauma**
- **Prior sup.thrombo.phl.**




Blood flow to the heart and lungs
Venous clot
Swelling and inflammation below the blockage site
Normal leg
DVT

Acute pelvic deep vein thrombosis



- **Manifestations: prominent superficial venous pattern, edema, muscle turgidity, and discomfort .**

  these findings may be absent.
- **Less than 50% of DVT , have the diagnosis confirmed when tested objectively.**

- **Treatment** :heparin(PTT 2 time of normal level) and warfarin(INR 2-3) for 12-16 weeks (6-12 month for spontaneous DVT) to preventing clot propagation and pulmonary embolism .
- Caval occlusive procedures (filter), when anticoagulants are contraindicated
- Early Thrombolytic therapy accelerates recovery and reduce incidence or severity of postphlebitic syndrome
- Long-term compression stocking to the knee reduces the incidence of postphlebitic synd. , venous stasis changes, and venou ulceration.
- Direct trombin inhibitor,lepirudin, or Argatroban, if heparin is contraindicated due to thrombocytopenia.

Superficial thrombophlebitis

- **Definition: warm, tender, erythematous, indurated ,linear lesion in the anatomic course of a superficial vein**
- **D.D: lymphangitic streaks, erythema nodosum . Differentiated with ultrasound**
- **Often occur at site of indwelling catheter or needles , may be infected**
- **Suppurative thrombophlebitis often requires surgical removal**
- **Can be idiopathic or associated with malignancy , TAO, or vasculitis**
- **Usually is self limited , but rest, topical warmth, and NSAIDS ,(anticoagulant if indicated) accelerated recovery.**

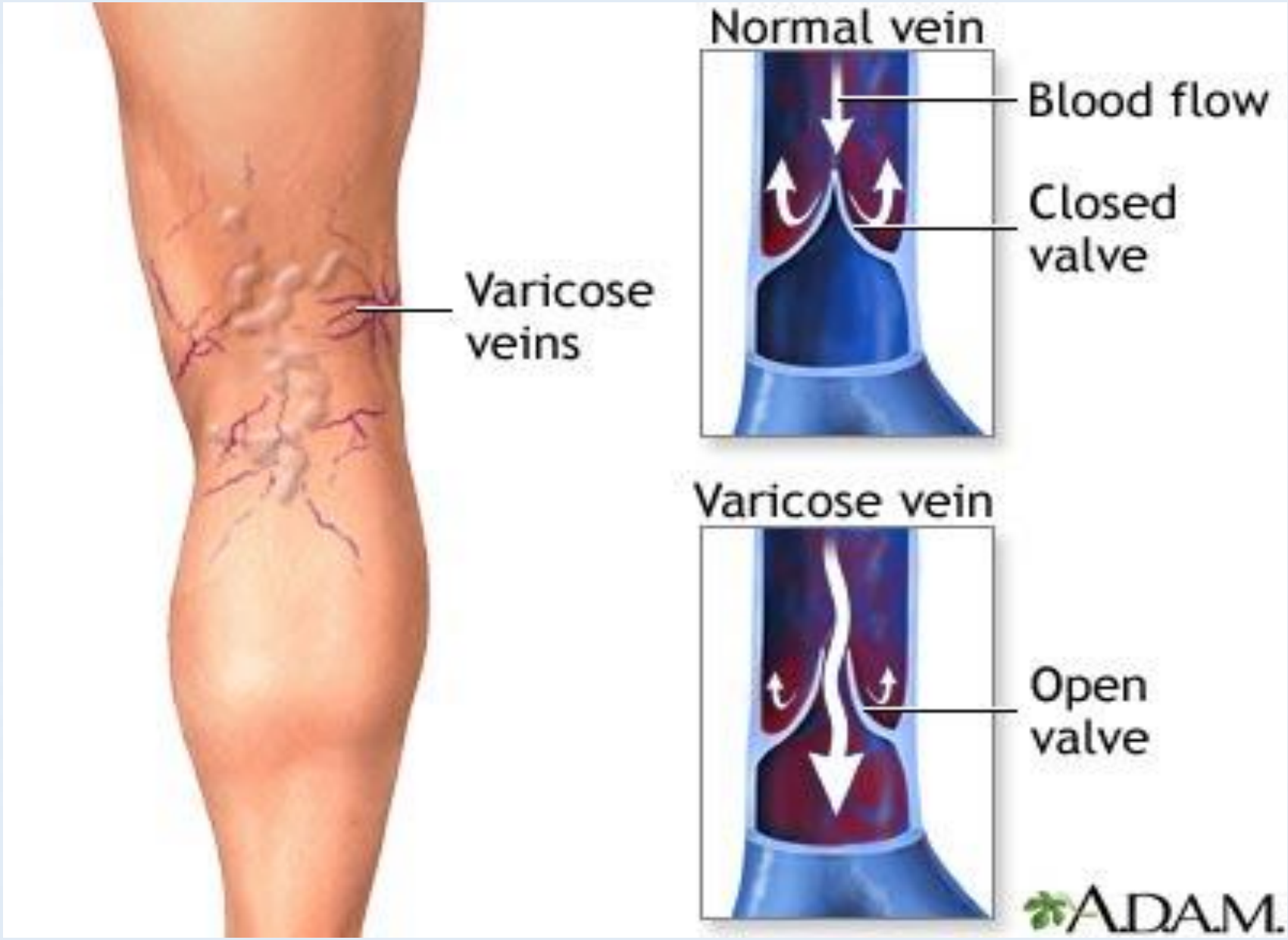
varicose veins

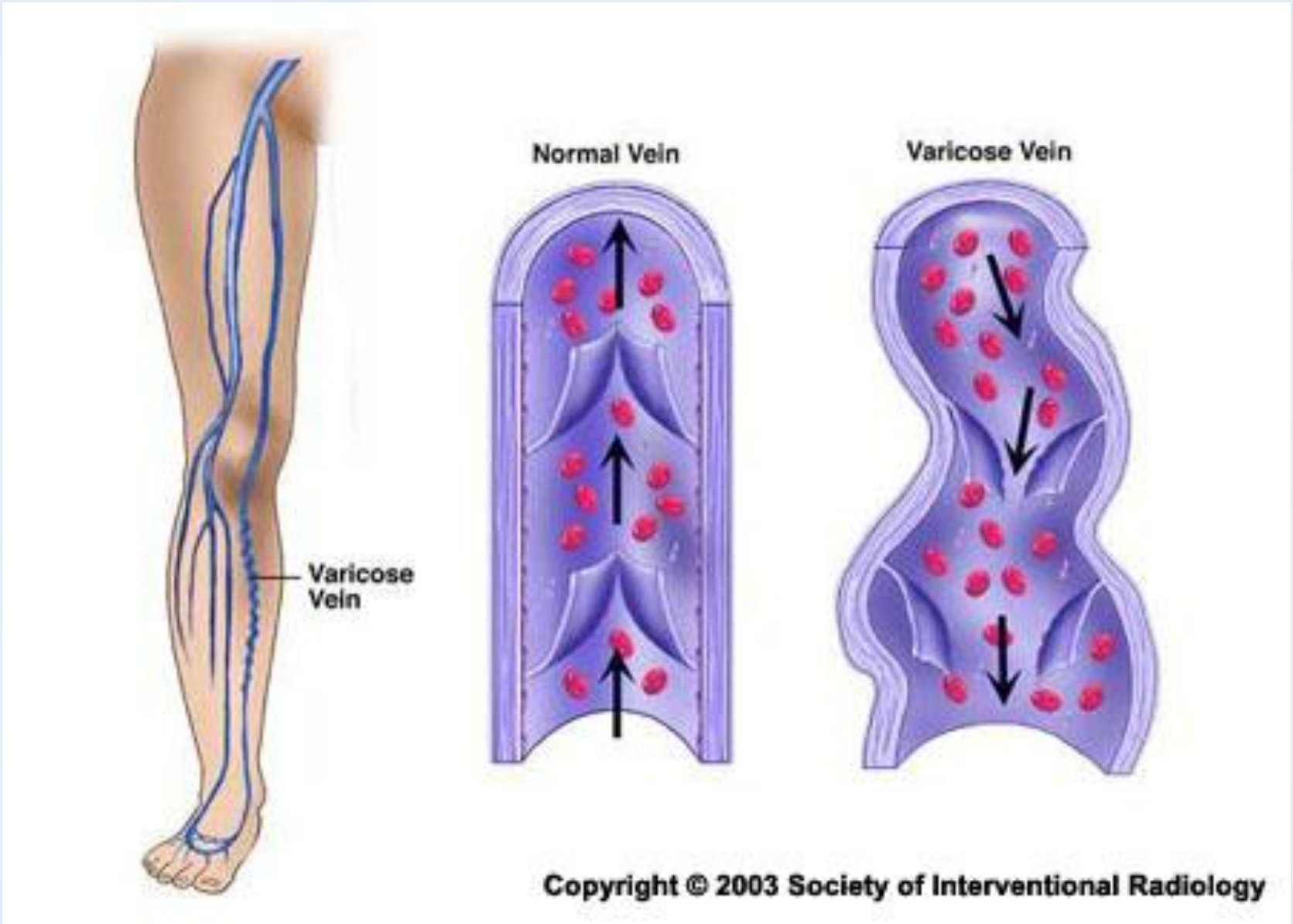
- **Incompetence of one or more valves or vein wall produce varicosities of superficial veins**

Primary :often a familial trait , symptoms exacerbated by prolong standing, obesity, and pregnancy

Secondary : reflect underlying perforator and deep venous obstruction.

common cause include: extrinsic venous compression, prior DVT, congenital lesion, AV fistula, and RV failure


Varicose veins
Normal vein
Blood flow
Closed valve
Varicose vein
Open valve
A.D.A.M.


Varicose Vein
Normal Vein
Varicose Vein
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- Symptom: ache or burn with standing or prolong sitting enlargement over time ,and superficial thrombophlebitis , rarely may bleed that is brisk
- Graduated compression stocking of 20-30 mmhg ameliorate symptoms and progression
- Ablation of vein if interferes with lifestyle
- Sclerotherapy is effective in certain varico.
- Surgical removal for longer segments ,especially if perforator or saphenofemoral is incompetence


Before
After

Chronic venous insufficiency

- **Definition:**
- **Chronie deep vanous incompetence or obstruction**
- **Chronic venous insufficiency may result from DVT and/or valvular incompetence**
- **Leg edema, venous dilatation, intradermal deposition of proteins and hemosiderin, cutaneous fibrosis, lichenification, cellulitis , and ulceration**
- **Symptom:**
- **heavy congested limb, venous claudication, pruritus, and painless skin ulceration**
- **Predisposing f. :prior DVT, chronic RV failure, an AV fistula**

- **Diagnosis:**

Doppler, ultrasound, and venography

- **Treatment:**

-reduction of edema, control of venous hypertension with rigid or elastic support at 30-40 mmhg of compression

-Repair or replacement of proximal valves, bypass of iliocaval obstruction

-Patients should be advised to avoid prolonged standing or sitting

Laboratory assessment:

- **CT, MRI & venography for evaluation of venous system**
- **Venography is gold standard for DVT determination**
- **duplex ultrasound is most commonly used method, it has advantage for differentiates acute from old thrombus**
- **Continuous wave doppler detects the movement of blood**
- **Plethysmography for venous incompetence**


IRAN PAYA

Lymphatic disorders

LYMPHEDEMA

Etiology:

Primary: may be present at birth, isolated, or part of a congenital familial syndrome

Secondary: more common, with trauma, recurrent infection, obstruction by mass, infiltrative processes, or direct damage by irradiation , after radical mastectomy

Recurrent cellulitis is common in lymphedema, with streptococcus in toe trychophytosis .

Diagnosis:

- **History & physical examination**
- **Edema involve the toes**
- **Skin is thickened (peau d' orange)**

Testing:

- **Lymphangiography,injection in lymphatic vessle, that is more dificult**
- **Lymphoscintigraphy , with Tc_{99} labeled antimony trisulfid injected in subcutaneous tissue at distal site, that is easier and low risk.**

Treatment:

Compression, reduce size with elevation, mechanical pumping, or manual massage

Then, compression garment of 40-50 mmhg worn daily

Early treatment of cellulitis and fungal infection

Finally, lymphatic venous anastomosis

Reference

- **Harrison's PRINCIPLES OF INTERNAL MEDICINE Eighteenth Edition** Copyright 2012
- Chapter 249 vascular disease of the extrimities